

WHAT IS CLAIMED IS:

1. A light receiving apparatus for uniforming pulse
light emitted from a pulse light emitting apparatus by
oscillating means and receiving the light by a storage-
5 type position sensor, comprising means for obtaining
pulse light emitting frequency of said pulse light
emitting apparatus from a cycle of said oscillating
means and predetermined number of pulses of said pulse
light to start storage by said storage-type position
10 sensor and emit said pulse light from said pulse light
emitting apparatus by the obtained pulse light emitting
frequency.
2. The light receiving apparatus according to claim 1,
15 wherein said storage-type position sensor uses a non-
interlace type CCD camera which can control the storage
time when the light is received by the storage-type
position sensor.
- 20 3. The light receiving apparatus according to claim 1,
wherein said storage-type position sensor uses an
interlace type CCD camera which can control even/odd
storage time when the light is received by the storage-
type position sensor.
- 25 4. The light receiving apparatus according to claim 1,
wherein said storage time when the light is received by

the storage-type position sensor starts earlier than a pulse light emitting start and ends later than a pulse light emitting end.

5 5. The light receiving apparatus according to claim 1, wherein said pulse light emitting apparatus uses an excimer laser.

6. The light receiving apparatus according to claim 1,
10 wherein said pulse light emitting apparatus is controlled by two steps of a dummy pulse light emitting step and a measurement pulse light emitting step, and data storage by said storage-type position sensor is not carried out by the dummy pulse light emitting, but
15 by said measurement pulse light emitting, the storage time of said storage-type position sensor and said pulse light emitting frequency are obtained from the cycle of the oscillating means and the predetermined number of pulses to start the storage by said storage-
20 type position sensor and emit said pulse light from the pulse light emitting apparatus by the obtained pulse light emitting frequency.

7. The light receiving apparatus according to claim 1,
25 wherein the storage start of said storage-type position sensor and the pulse light emitting from said pulse

light emitting apparatus by the obtained pulse light emitting frequency are carried out simultaneously.

8. The light receiving apparatus according to claim 1,
5 wherein the oscillating cycle of the oscillating means is adjusted to said pulse light emitting frequency by adjusting the oscillation frequency of said oscillating means to the storage time of said storage-type position sensor, and there is no need for adjusting said
10 oscillating means to an image capture cycle by said light receiving apparatus.

9. The light receiving apparatus according to claim 1,
wherein there is no need for adjusting said oscillating
15 means to measurement, permitting use of the oscillation frequency of said oscillating means in exposure.

10. The light receiving apparatus according to claim 1,
wherein there is no need for synchronizing a staring
20 point of said oscillating means with the storage start of said storage-type position sensor, controlling the storage time of the storage-type position sensor corresponding to an amount of said pulse light required for the measurement.

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11. The light receiving apparatus according to claim 1,
wherein said pulse light of a few pulses is first

emitted to wait stabilization of energy of the pulse light and then start the storage by said storage-type position sensor for emitting light of required pulses.

- 5 12. A mark detecting apparatus, comprising means for
uniforming pulse light emitted from a pulse light
emitting apparatus by oscillating means, receiving the
light by a storage-type position sensor and obtaining
pulse light emitting frequency of said pulse light
10 emitting apparatus from a cycle of said oscillating
means and predetermined number of pulses of said pulse
light to start storage by said storage-type position
sensor and emit said pulse light from said pulse light
emitting apparatus by the obtained pulse light emitting
15 frequency,

wherein a mark on a substrate is irradiated with
said pulse light which is uniformed by said oscillating
means and output by said pulse light emitting apparatus,
and reflected light from the mark is received by said
20 storage-type position sensor to detect the mark.

13. The mark detecting apparatus according to claim 12,
wherein an amount of the reflected light of the mark is
measured by the mark.

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14. The mark detecting apparatus according to claim 12,
wherein contrast of the mark is measured by the mark.

15. The mark detecting apparatus according to claim 12,
wherein a position of the mark is measured by the mark.

5 16. An exposing apparatus for projecting a pattern on
an original plate stage on a substrate of a substrate
stage via a projection lens, comprising:

a mark detecting apparatus for detecting one or
both of a positioning mark on said original plate stage
10 and a positioning mark on said substrate stage,

said mark detecting apparatus comprising means for
uniforming pulse light emitted from a pulse light
emitting apparatus by oscillating means, receiving the
light by a storage-type position sensor and obtaining
15 pulse light emitting frequency of said pulse light
emitting apparatus from a cycle of said oscillating
means and predetermined number of pulses of said pulse
light to start storage by said storage-type position
sensor and emit said pulse light from said pulse light
20 emitting apparatus by the obtained pulse light emitting
frequency,

wherein a mark on a substrate is irradiated with
said pulse light which is uniformed by said oscillating
means and output by said pulse light emitting apparatus,
25 and reflected light from the mark is received by said
storage-type position sensor to detect the mark.

17. An exposing apparatus for projecting a pattern on an original plate stage on a substrate of a substrate stage via a projection lens, comprising:

a mark detecting apparatus for detecting one or
5 both of a contrast measurement mark on said original plate stage and a contrast measurement mark on said substrate stage,

said mark detecting apparatus comprising means for
uniforming pulse light emitted from a pulse light
10 emitting apparatus by oscillating means, receiving the light by a storage-type position sensor and obtaining pulse light emitting frequency of said pulse light emitting apparatus from a cycle of said oscillating means and predetermined number of pulses of said pulse
15 light to start storage by said storage-type position sensor and emit said pulse light from said pulse light emitting apparatus by the obtained pulse light emitting frequency,

wherein a mark on a substrate is irradiated with
20 said pulse light which is uniformed by said oscillating means and output by said pulse light emitting apparatus, and reflected light from the mark is received by said storage-type position sensor to detect the mark.

25 18. A manufacturing method of a semiconductor device, comprising steps of:

locating a plurality of semiconductor
manufacturing apparatuses including an exposing device
in a plant; and

manufacturing the semiconductor device using the
5 plurality of semiconductor manufacturing apparatuses,

said exposing apparatus comprising a mark
detecting apparatus for detecting one or both of a
positioning mark on an original plate stage and a
positioning mark on a substrate stage,

10 said mark detecting apparatus comprising means for
uniforming pulse light emitted from a pulse light
emitting apparatus by oscillating means, receiving the
light by a storage-type position sensor and obtaining
pulse light emitting frequency of said pulse light
15 emitting apparatus from a cycle of said oscillating
means and predetermined number of pulses of said pulse
light to start storage by said storage-type position
sensor and emit said pulse light from said pulse light
emitting apparatus by the obtained pulse light emitting
20 frequency,

wherein a mark on a substrate is irradiated with
said pulse light which is uniformed by said oscillating
means and output by said pulse light emitting apparatus,
and reflected light from the mark is received by said
25 storage-type position sensor to detect the mark.

19. A manufacturing method of a semiconductor device,
comprising steps of:

locating a plurality of semiconductor
manufacturing apparatuses including an exposing device
5 in a plant; and

manufacturing the semiconductor device using the
plurality of semiconductor manufacturing apparatuses,
said exposing apparatus comprising a mark
detecting apparatus for detecting one or both of a
10 contrast measurement mark on an original plate stage
and a contrast measurement mark on a substrate stage,
said mark detecting apparatus comprising means for
uniforming pulse light emitted from a pulse light
emitting apparatus by oscillating means, receiving the
15 light by a storage-type position sensor and obtaining
pulse light emitting frequency of said pulse light
emitting apparatus from a cycle of said oscillating
means and predetermined number of pulses of said pulse
light to start storage by said storage-type position
20 sensor and emit said pulse light from said pulse light
emitting apparatus by the obtained pulse light emitting
frequency,

wherein a mark on a substrate is irradiated with
said pulse light which is uniformed by said oscillating
25 means and output by said pulse light emitting apparatus,
and reflected light from the mark is received by said
storage-type position sensor to detect the mark.

20. The manufacturing method of the semiconductor device according to claim 18, further comprising steps of:

5 connecting said plurality of semiconductor manufacturing apparatuses with a local area network;
 connecting said local area network with an external network outside said semiconductor manufacturing plant;

10 obtaining information on said exposing apparatus from database on said external network using said local area network and said external network; and

 controlling said exposing apparatus based on said obtained information.

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21. The manufacturing method of the semiconductor device according to claim 19, further comprising steps of:

 connecting said plurality of semiconductor
20 manufacturing apparatuses with a local area network;
 connecting said local area network with an external network outside said semiconductor manufacturing plant,

 obtaining information on said exposing apparatus
25 from database on said external network using said local area network and said external network; and

controlling said exposing apparatus based on said
obtained information.

22. The manufacturing method of the semiconductor
5 device according to claim 18, wherein maintenance
information of said manufacturing apparatus is obtained
through data communication by having access to database
provided by a vendor or user of said exposing apparatus
via said external network, or production management is
10 carried out through data communication with a
semiconductor manufacturing plant different from said
semiconductor manufacturing plant via said external
network.

15 23. The manufacturing method of the semiconductor
device according to claim 19,
wherein maintenance information of said
manufacturing apparatus is obtained through data
communication by having access to database provided by
20 a vendor or user of said exposing apparatus via said
external network, or production management is carried
out through data communication with a semiconductor
manufacturing plant different from said semiconductor
manufacturing plant via said external network.

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24. A semiconductor manufacturing plant, comprising:

a plurality of semiconductor manufacturing apparatuses including an exposing apparatus;

a local area network for connecting said plurality of semiconductor manufacturing apparatuses; and

5 a gateway for connecting said local area network with an external network outside said semiconductor manufacturing plant, permitting data communication of information on at least one of said plurality of semiconductor manufacturing apparatuses,

10 said exposing apparatus comprising a mark detecting apparatus for detecting one or both of a positioning mark on an original plate stage and a positioning mark on a substrate stage,

said mark detecting apparatus comprising means for
15 uniforming pulse light emitted from a pulse light emitting apparatus by oscillating means, receiving the light by a storage-type position sensor and obtaining pulse light emitting frequency of said pulse light emitting apparatus from a cycle of said oscillating
20 means and predetermined number of pulses of said pulse light to start storage by said storage-type position sensor and emit said pulse light from said pulse light emitting apparatus by the obtained pulse light emitting frequency,

25 wherein a mark on a substrate is irradiated with said pulse light which is uniformed by said oscillating means and output by said pulse light emitting apparatus,

and reflected light from the mark is received by said storage-type position sensor to detect the mark.

25. A semiconductor manufacturing plant, comprising
5 a plurality of semiconductor manufacturing
apparatuses including an exposing apparatus,
a local area network for connecting said plurality
of semiconductor manufacturing apparatuses,
a gateway for connecting said local area network
10 with an external network outside said semiconductor
manufacturing plant, permitting data communication of
information on at least one of said plurality of
semiconductor manufacturing apparatuses,
said exposing apparatus comprising a mark
15 detecting apparatus for detecting one or both of a
contrast measurement mark on an original plate stage
and a contrast measurement mark on a substrate stage,
said mark detecting apparatus comprising means for
uniforming pulse light emitted from a pulse light
20 emitting apparatus by oscillating means, receiving the
light by a storage-type position sensor and obtaining
pulse light emitting frequency of said pulse light
emitting apparatus from a cycle of said oscillating
means and predetermined number of pulses of said pulse
25 light to start storage by said storage-type position
sensor and emit said pulse light from said pulse light

emitting apparatus by the obtained pulse light emitting frequency,

wherein a mark on a substrate is irradiated with said pulse light which is uniformed by said oscillating means and output by said pulse light emitting apparatus, and reflected light from the mark is received by said storage-type position sensor to detect the mark.

26. A maintenance method of an exposing apparatus, comprising steps of:

preparing database which stores information on maintenance of said exposing apparatus on an external network outside a plant where said exposing apparatus is located;

connecting said exposing apparatus with a local area network in said plant; and

maintaining said exposing apparatus based on the information stored in said database using said external network and said local area network,

said exposing apparatus comprising a mark detecting apparatus for detecting one or both of a positioning mark on said original plate stage and a positioning mark on said substrate stage, said mark detecting apparatus comprising means for uniforming pulse light emitted from a pulse light emitting apparatus by oscillating means, receiving the light by a storage-type position sensor and obtaining pulse

light emitting frequency of said pulse light emitting
apparatus from a cycle of said oscillating means and
predetermined number of pulses of said pulse light to
start storage by said storage-type position sensor and
5 emit said pulse light from said pulse light emitting
apparatus by the obtained pulse light emitting
frequency,

wherein a mark on a substrate is irradiated with
said pulse light which is uniformed by said oscillating
10 means and output by said pulse light emitting apparatus,
and reflected light from the mark is received by said
storage-type position sensor to detect the mark.

27. A maintenance method of an exposing apparatus,
15 comprising steps of:

preparing database which stores information on
maintenance of said exposing apparatus on an external
network outside a plant where said exposing apparatus
is located;

20 connecting said exposing apparatus with a local
area network in said plant; and

maintaining said exposing apparatus based on the
information stored in said database using said external
network and said local area network,

25 said exposing apparatus comprising a mark
detecting apparatus for detecting one or both of a

contrast measurement mark on said original plate stage
and a contrast measurement mark on said substrate stage,

said mark detecting apparatus comprising means for
uniforming pulse light emitted from a pulse light
5 emitting apparatus by oscillating means, receiving the
light by a storage-type position sensor and obtaining
pulse light emitting frequency of said pulse light
emitting apparatus from a cycle of said oscillating
means and predetermined number of pulses of said pulse
10 light to start storage by said storage-type position
sensor and emit said pulse light from said pulse light
emitting apparatus by the obtained pulse light emitting
frequency,

wherein a mark on a substrate is irradiated with
15 said pulse light which is uniformed by said oscillating
means and output by said pulse light emitting apparatus,
and reflected light from the mark is received by said
storage-type position sensor to detect the mark.

20 28. The exposing apparatus according to claim 16,
further comprising a display, a network interface and a
computer for executing software for network, permitting
data communication of the maintenance information of
the exposing apparatus via a computer network.

25 29. The exposing apparatus according to claim 17,
further comprising a display, a network interface and a

computer for executing software for network, permitting data communication of the maintenance information of the exposing apparatus via a computer network.

- 5 30. The exposing apparatus according to claim 16,
wherein said software for network provides a user
interface on said display which is connected to the
external network outside the plant where said exposing
apparatus is located and for having access to the
10 database which stores the maintenance information
provided by the vendor or user of said exposing
apparatus, permitting obtaining information from the
database via said external network.
- 15 31. The exposing apparatus according to claim 17,
wherein said software for network provides a user
interface on said display which is connected to the
external network outside the plant where said exposing
apparatus is located and for having access to the
20 database which stores the maintenance information
provided by the vendor or user of said exposing
apparatus, permitting obtaining information from the
database via said external network.
- 25 32. The light receiving apparatus according to claim 1,
wherein the storage time when the light is received by
said storage-type position sensor is obtained from the

cycle of said oscillating means and predetermined number of pulses of said pulse light to control the storage-type position sensor based on the storage time.

5 33. The mark detecting apparatus according to claim 12,
wherein the storage time when the light is received by
said storage-type position sensor is obtained from the
cycle of said oscillating means and predetermined
number of pulses of said pulse light to control the
10 storage-type position sensor based on the storage time.

34. The exposing apparatus according to claim 16,
wherein the storage time when the light is received by
said storage-type position sensor is obtained from the
15 cycle of said oscillating means and predetermined
number of pulses of said pulse light to control the
storage-type position sensor based on the storage time.

35. The exposing apparatus according to claim 17,
20 wherein the storage time when the light is received by
said storage-type position sensor is obtained from the
cycle of said oscillating means and predetermined
number of pulses of said pulse light to control the
storage-type position sensor based on the storage time.

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36. The light receiving apparatus according to claim 1,
wherein the cycle (YS) of said oscillating means is

obtained from the number of rotation (R) of the oscillating means and the number of oscillation (Y) by Equation 1,

the number of oscillating revolution (YT) of said
5 oscillating means is obtained from the cycle (YS) obtained by Equation 1, the number of pulses (P) of the oscillating means and maximum frequency (LM) of the pulse light emitted from said pulse light emitting apparatus by Equation 2,

10 laser frequency (LF) is obtained from the number of oscillating revolution (YT) obtained by Equation 2, the cycle (YS) of said oscillating means obtained by Equation 1 and the number of pulses (P) of the oscillating means by Equation 3, and

15 the storage time of said storage-type position sensor is obtained from the oscillation cycle (YS) obtained by Equation 1 and the number of oscillating revolution (YT) obtained by Equation 2 by Equation 4,

Equations 1 to 4 being formulated by the following
20 relational expression.